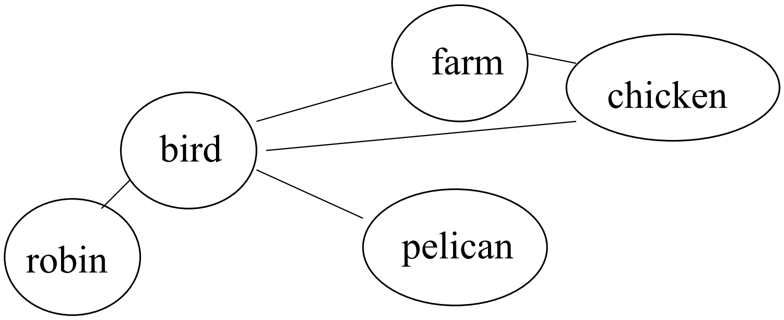


Consider this spreading activation model of knowledge organization. Which of the following will the model be able to explain?

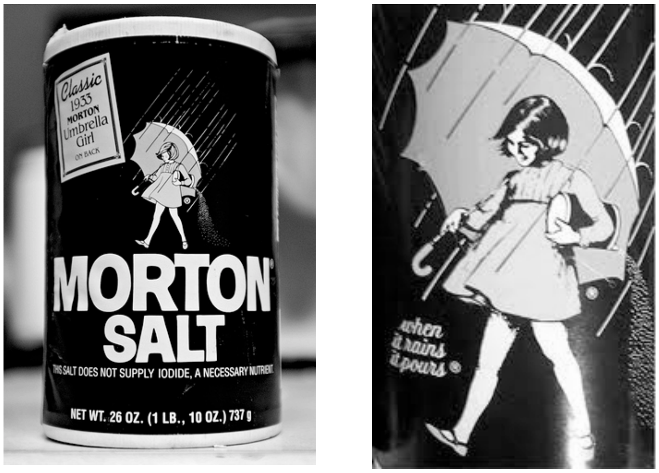
I. Typicality effects: People are faster to respond “yes” to “A robin is a bird” than “A pelican is a bird”

II. Context effects: People respond more quickly to “robin” than “chicken” after reading “bird” BUT they respond more quickly to “chicken” than “robin” after reading “farm bird”

III. Semantic priming effects: People respond more quickly to “pelican” after having seen “robin” than after having seen “table”

Visual Imagery

- What does a can of Morton salt look like?
- There’s a girl on the container. Did you image her? If so, what is she holding? What color are her shoes?


Classic
1933
MORTON
Umbrella
Girl
ON BACK
MORTON®
SALT
THIS SALT DOES NOT SUPPLY IODIDE, A NECESSARY NUTRIENT
NET WT. 26 OZ. (1 LB., 10 OZ.) 737 g
when it rains it pours ®

Introspective Reports

- Francis Galton (famous psychologist from late 1800s)
  - participants report “inspecting” their mental images
  - able to read off details like color and texture
  - lots of variability across participants
    - some report seeing an image vividly
    - others repot only sketchy images, if any images are available at all.
- **But can we trust self-report data?**

Imagery vs. Propositions

- Is the experience of mental imagery an *epiphenomenon* (a side-effect), or do we truly think and reason using *mental images?*
  - Image argument: imagery involves direct mental operation on images, spatial representations
  - Epiphenomenon argument: just because we experience images doesn’t mean that the underlying mental representations are imagistic. Instead, they are **propositional**.

Analog representations

* To understand whether or not some mental representations are image-like, need to

- focus on how propositional and analog representations are different
- determine what *different* behaviors each view would predict

Symbolic	Imagistic
Examples: words, numbers, variables	Examples: photographs, maps, caricatures
Abstract	Concrete
Relation by convention	Iconic
Discrete	Distributed
No spatial medium	Spatial medium
No point-for-point correspondence	Point-for-point correspondence
Unambiguous	Ambiguous

Properties of mental images

- * *Spatial equivalence:* spatial arrangement of objects in mental images corresponds to actual arrangement in real world.
- * *Transformational equivalence:* operations performed on images have the same dynamic characteristics as in real world.

Propositional Analog

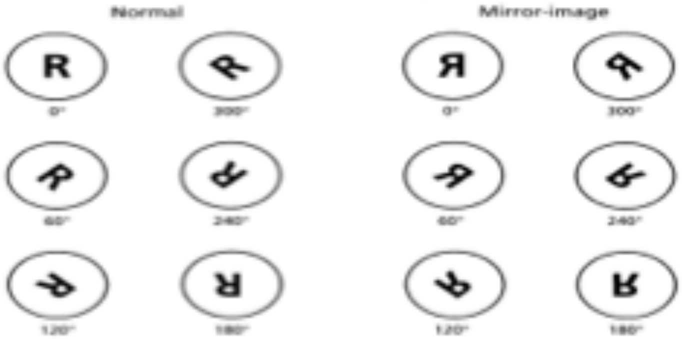
“The phone is on the
right side of the (small) desk.”

“The phone is on the
right side of the (big) desk.”

Finding images

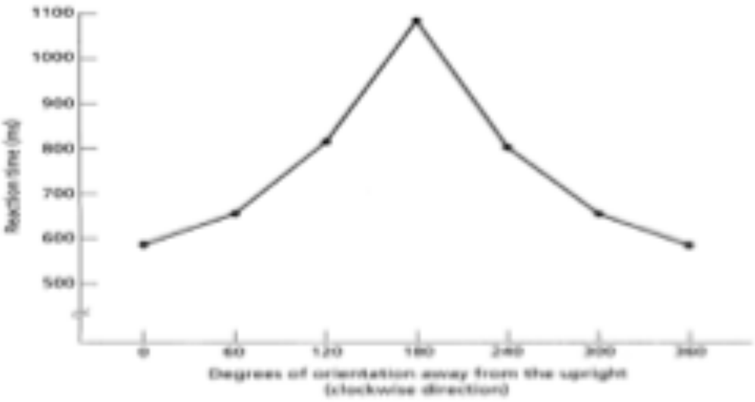
- How do we demonstrate the existence of mental images?
- Must think about the kind of behaviors that the use of mental images should predict.

Remember mental rotation?



Different degrees of rotations performed on the materials (Cooper & Shepard, 1973)

Mental Rotation



Reaction time to decide orientation of a visual stimulus

Mental Rotation

- As the letter was rotated more degrees away from upright, reaction times were longer.
- This relationship was very systematic, and the peak time was for a 180 degree rotation.
- Looks like real rotation in the world!
- Behavior strongly suggests that people are using an internal image which they rotate just like a physical object.
- If the representation were propositional, would we predict this?

Visual Buffer Model

Kosslyn

(1) generate image
(2) inspect image
(3) hold onto image
(4) transform image

Image generation

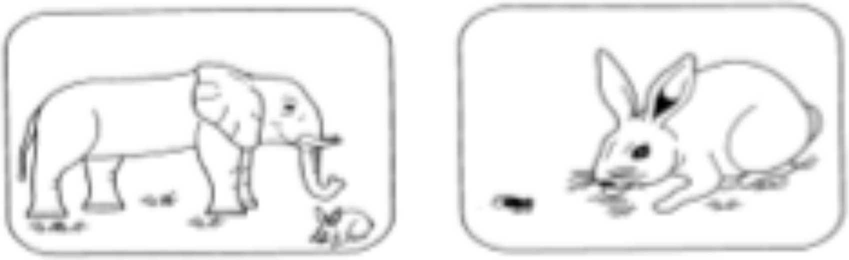
Imagine a rabbit next to . . .

- GROUP 1: a fly
- GROUP 2: an elephant

Raise your hand as soon as you know the answer to my next question.

Image generation

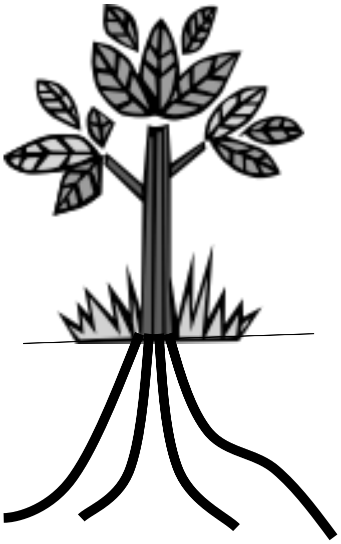
An illustration of how a rabbit may be imaged at different levels of detail



Results

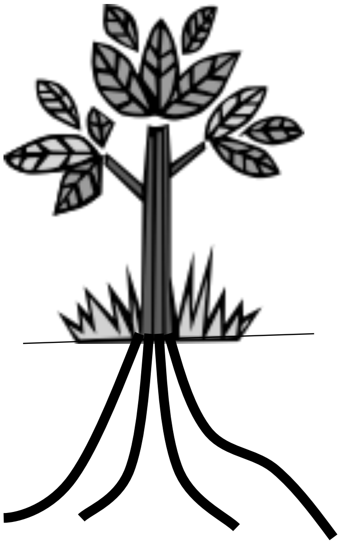
- People are faster to answer questions when the comparison object is smaller.
- Just like if closer or further from the rabbit in real life.
- Suggests that the visual buffer has a limited size and that people tend to “fill” the buffer.
- If object is too small on buffer, have to “zoom in” to answer question.

Image inspection



- See pictures like this one and asked to memorize.
- Told to imagine picture and to focus on one part (e.g., the roots).
- Asked a question.

Image inspection



- When focusing on the roots, took longer to answer question about leaves than about trunk.
- Suggests subjects are spatially scanning a mental image.

Image inspection

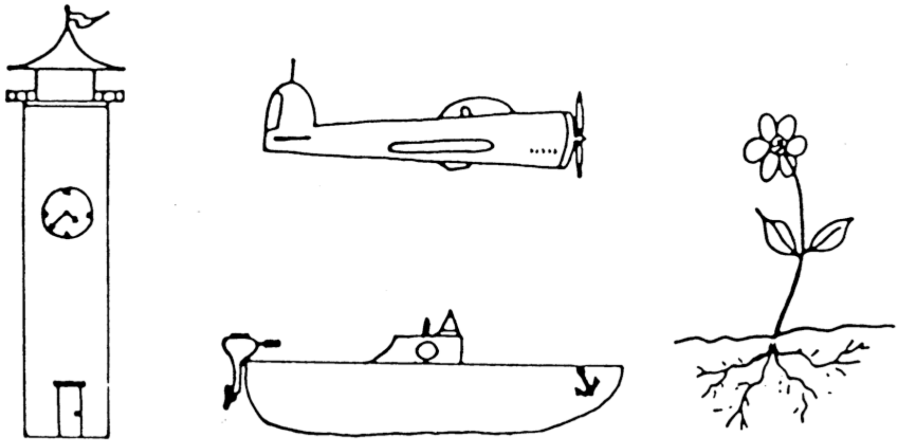
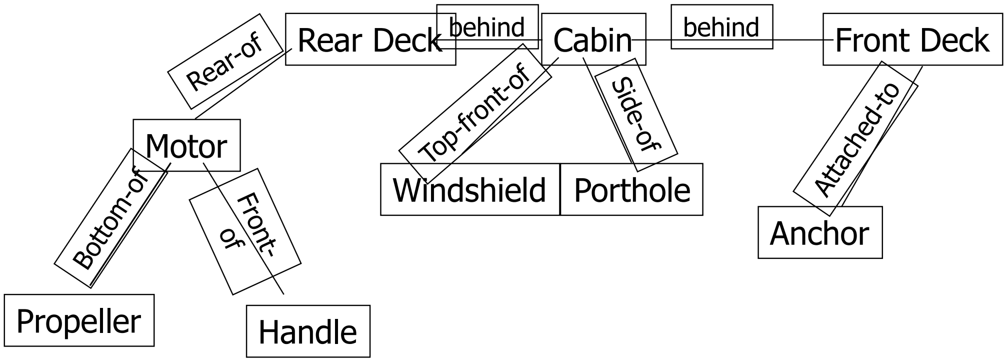


Figure 3.5

Examples of the drawings used by Kosslyn (1973) to study image scanning.

Image inspection



Rear Deck
behind
Cabin
behind
Front Deck
Rear-of
Top-front-of
Side-of
Attached-to
Motor
Windshield
Porthole
Anchor
Bottom-of
Front-of
Propeller
Handle

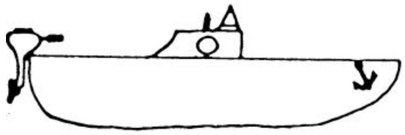
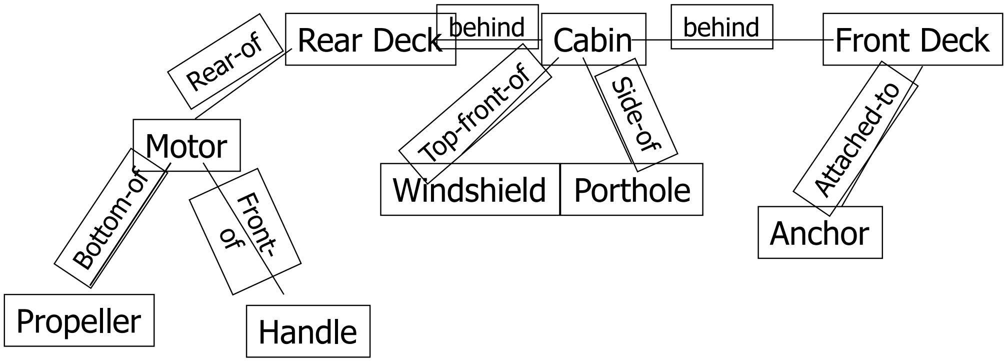


Image inspection



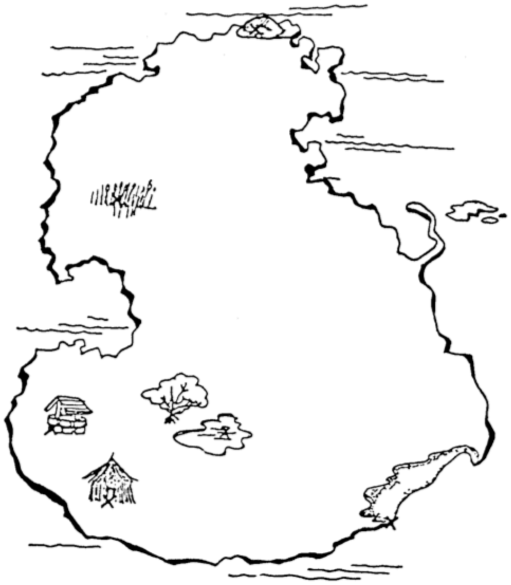
Rear Deck
behind
Cabin
behind
Front Deck
Rear-of
Top-front-of
Side-of
Attached-to
Motor
Windshield
Porthole
Anchor
Bottom-of
Front-of
Propeller
Handle

Could get similar results with a propositional representation if assume that you have to scan through more items when they are further away.

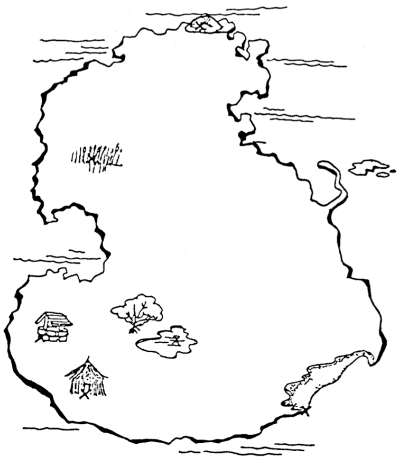
Image inspection

- Are the image distance effects (greater RT to answer question about visually distant items) due to
  - spatial distance or
  - number of intervening items (propositions)
- ➢Follow-up experiments:
  - ➢Need to separate out effects of DISTANCE from NUMBER OF ITEMS.

The Map Experiment

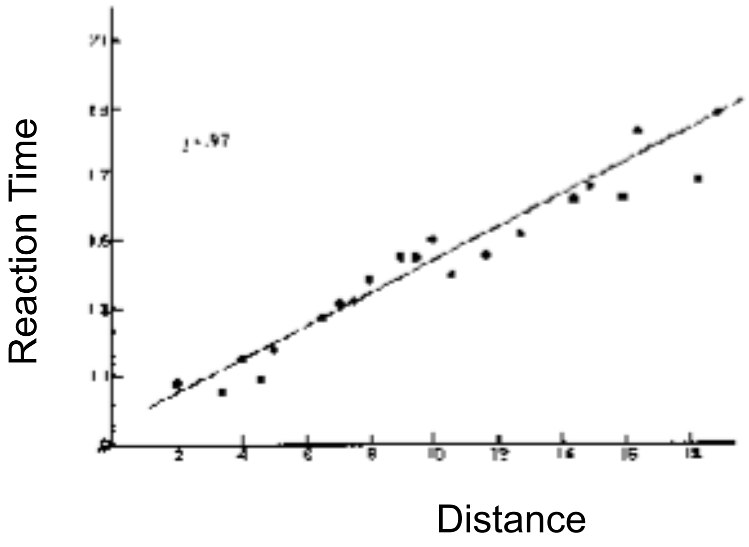


The Map Experiment



- Subjects had to memorize map of island.
- During test, had to image the island.
  - given a starting location
  - given a target location
  - press button when have “located” target

The Map Experiment Results



The Map Experiment: Results

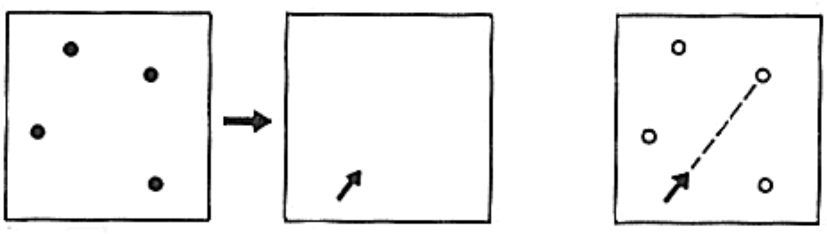
- RT measurements showed evidence of “image-scanning” at a constant rate:
  - Reaction times were longer when objects were further apart (in centimeters) on the original map.
  - Number of intervening items did not matter, just physical distance.
  - Hard to explain with propositions.

BUT . . .

- What about *demand characteristics*?
- Maybe subjects thought that it “should” take longer because they know that is how it works in the real world.
- So subjects “create” the data that they think the experimenter expects.

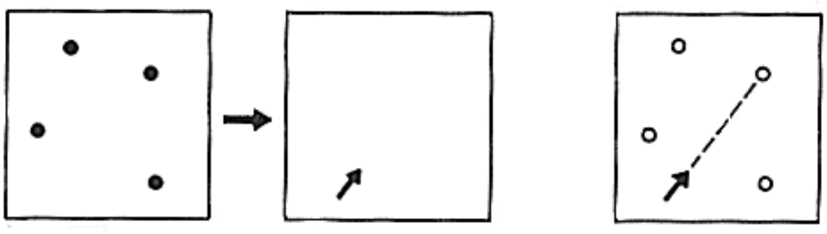
- How could we control for this?

A clever control (Finke and Pinker)



- Subjects shown display of dots. After dots disappear, arrow comes up and subjects must decide if the arrow would have pointed to a dot.
- Assume that subjects will make a mental image of dots to decide (if there are mental images!)

A clever control (Finke and Pinker)



- Found that reaction time increased systematically with distance between arrow tip and dot.
- NO instructions to scan from arrow to dot -- no obvious demand characteristics.
- So strong support for reality of scanning effects.

Interim summary

- Original bias to assume just one type of representation (propositional) since seems more efficient.
- But behavioral data suggest humans also have image-based representations.

Imagery vs. Perception

- Are mental imagery and perception part of the same phenomenon, or are they different?
- We will consider…
  - evidence from brain damage
  - dual-task method
  - mental image manipulation

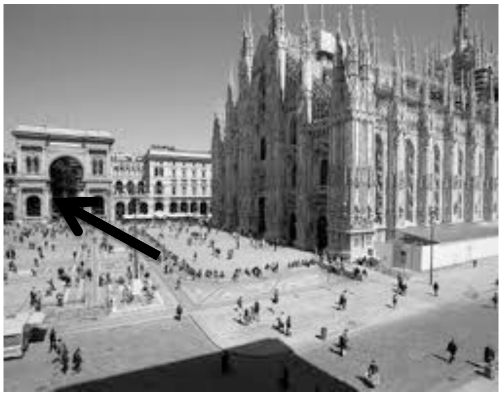
Hemineglect patients

- Hemineglect patients
  - ignore one half of space
  - only see things on the right side
- What happens when they image?

Bisiach and Luzzatti (1978)

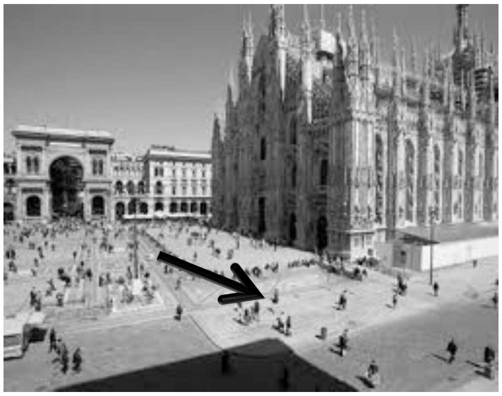
- Tested hemineglect patients who had lived in Milan all their life.
- Famous square (Piazza del Duomo).
- Asked to imagine looking at the square with their backs to the cathedral.
- Describe the square.

Bisiach and Luzzatti (1978)



- Patients describe only locations on the right.

Bisiach and Luzzatti (1978)



- Now asked to imagine piazza as if *facing* the cathedral.
- Describe again.

Bisiach and Luzzatti (1978)

- Now patients list the previously ignored locations and ignore the previously listed ones!

- Patients show the SAME deficit in their imagery as they do in their perception.
- Suggests that imagery uses the SAME brain areas as perception.

Imagery vs. Vision

- In healthy individuals are imagery and vision drawing on the same resources?
- Dual-task method. Logic:
  - if draw on same resources, imagery and vision tasks should compete
  - if draw on different resources, imagery and vision should not compete

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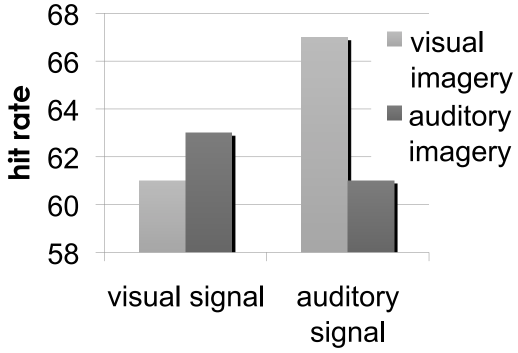
Imagery vs. Vision

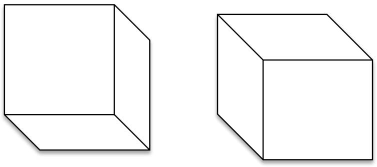
- Segal & Fusella (1970, 1971)
  - participants detect faint signals (tones or visual stimuli)– Y or N response
  - secondary task: visual imagery or auditory imagery

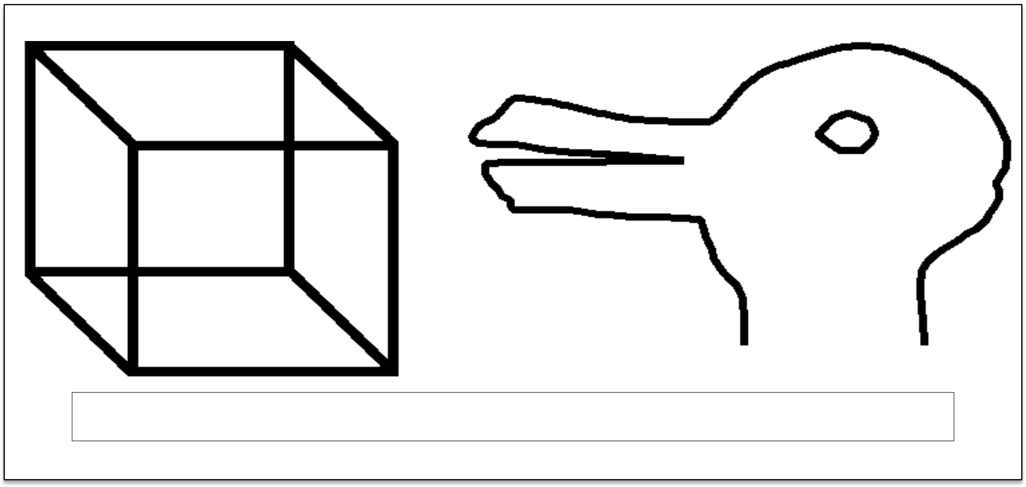


But … images are not pictures

- Evidence suggests that mental images are not equivalent to “pictures” in the mind
  - instead images are interpretations
- Evidence from ambiguous images

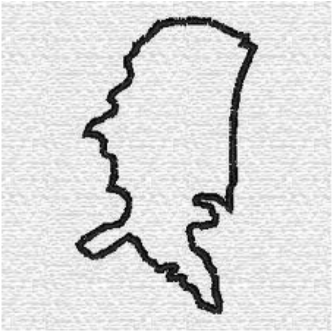
What do you see?





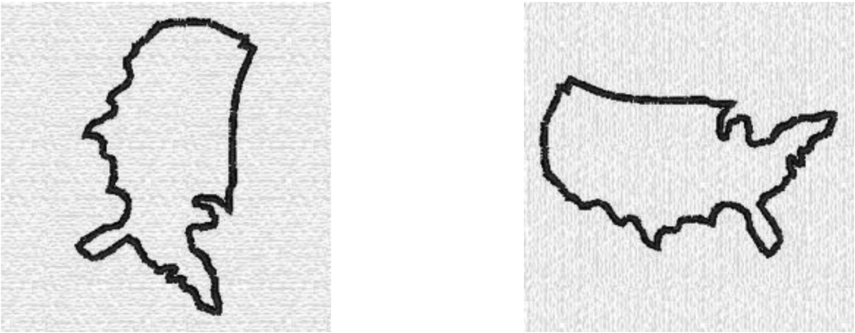
Reinterpreting images

- Is it possible to re-interpret a previous image?
- Reisberg & Chambers (1991)
- First… study the following picture:
- Now, rotate 90 degrees counterclockwise … what do you see?



Reinterpreting images

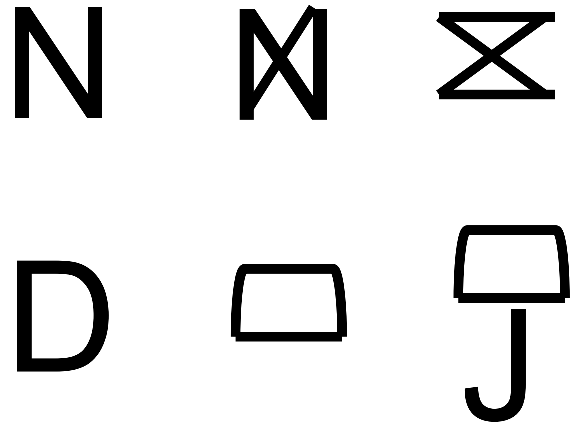
- no participants report seeing the USA



Another demonstration…

- Imagine a capital letter N. Connect a diagonal line from the top right corner to the bottom left corner. Now rotate the figure 90 degrees to the right. What do you see?
- Imagine a capital letter D. Rotate the figure 90 degrees to the left. Now place a capital J at the bottom. What do you see?

Another demonstration…



Another demonstration…

- Most people can do, but effortful.
- If given choice, people will manipulate object in real world rather than in image.
- Images also tend to lack detail

- But images are generative: can create images of things we have never seen.

Why image?

- Help prepare for processing of upcoming stimuli.
- Mental simulation
  - can practice in our heads
  - research shows this improves performance
- Can store details in images and important features in propositions.
  - look up data quickly from propositions
  - or re-examine image if need additional info

Example question

A patient with damage to the right hemisphere of the brain can quickly report that the sky is blue and the grass is green (when not able to see the sky or the grass), but cannot report the color of the rug in his bedroom. A patient with damage to the left hemisphere, instead, can answer all three questions correctly, but is much slower than the first patient to answer the questions about the sky and the grass. Based on this, what might we conclude?